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be displayed without supply of energy, subsequent to feeding the information to the LCD elements.

REMARKS

This Preliminary Amendment cancels, without prejudice, claims 1-9 in the underlying PCT application PCT/DE99/00815. This Preliminary Amendment further cancels, without prejudice, claims 1-4 in the annex to the International Preliminary Examination Report, and adds new claims 10-18. The new claims, inter alia, conform the claims to U.S. Patent and Trademark Office rules and do not add new matter to the application.

The above amendments to the title, the specification and the abstract conform the title, the specification and the abstract to U.S. Patent and Trademark Office rules, and do not introduce new matter into the application.

The underlying PCT application includes an International Preliminary Examination Report ("IPER"), dated August 7, 2000. An English translation of the IPER and the annex thereto is included herewith.

It is respectfully submitted that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully submitted,

Dated: 2/21/01

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ELECTRONIC TRIPPING DEVICE COMPRISING CONTROL AND DISPLAY  
ELEMENTS

The present invention relates to an electronic tripping device, in particular for low-voltage circuit-breakers, having  
5 adjusting and display elements for the tripping parameters to be adjusted, such as for the tripping current in the case of overload and for the corresponding delay time, the adjusting and display elements cooperating with adjusting devices for the parameters, and the adjusting and display elements being  
10 mounted at an operating face of the tripping device.

An overcurrent trip of this kind is described, for example, in U.S. Patent 5 051 861.

15 There are analogously and digitally operating tripping devices. The analogously operating tripping devices simulate a tripping value, for example, a tripping current, generally using resistors and capacitors. The digitally operating tripping devices contain a microprocessor having a permanently  
20 input program and work in cycles, i.e., they check for example, the level of the current as well as the given requirements within the scope of a sequential sequence, and decide whether or not tripping should be carried out, giving a corresponding tripping command if indicated. In both, it must  
25 be adjustable by a user via suitable adjusting elements whether, or rather when a tripping command is to be emitted.

In the analog tripping devices known heretofore, as a rule, the tripping parameters are adjusted with the aid of  
30 potentiometers, rotary coding switches, or DIP switches which can be accessed at the operating face of the tripping device, cf. mentioned U.S. Patent 5 051 861.

Used in digitally operating tripping devices are equally arranged coding switches, possibly of the same kind, which define a corresponding switching threshold by a combination of positions. All these adjusting and coding switches, which  
5 generally contain mechanical contacts, are complicated, very small elements whose reliability frequently leaves something to be desired, in particular because these switching devices, which are provided with contacts and which are extremely delicate due to their small size, can easily be impaired by  
10 dust, moisture, and vibrations frequently found in the environment of switching stations. In addition, these coding switches are operated at very low voltages and small currents. If the intentions is for the mentioned deficiencies to be eliminated, considerable outlay is required, resulting in a  
15 considerable increase in price. Also, the readability is often unsatisfactory since, due to the space requirements, very small adjusting switches having correspondingly small scales are chosen.

20 Apart from the adjustment of tripping devices using mechanical switches of the mentioned kind, it is known to store all adjustment values in a chip card and to transfer the adjustment values by inserting the chip card into the tripping device which possesses a card reader. A design approach of  
25 that kind is shown in Fig. 1 of German Patent DE-OS 44 45 079. On the control console containing the control elements, the display, and the hand lever for charging the stored-energy spring mechanism, the tripping unit is discernible as well which has a field with which the chip card is brought into  
30 contact. The chip card contains the adjustment values for the tripping unit, and is connected thereto via contacts, as a result of which the values stored on the chip card are transferred to the tripping unit. If the chip card is not put on, the tripping device is fixed at a basic adjustment having  
35 the lowest values possible so that no dangerous condition can arise. That is, without the chip card, the switch is operated at its minimum values.

Another proposal provides for the adjustment to be carried out via a serial interface with which the tripping devices can be equipped for transferring tripping values. However, this means that it is required to go close with a notebook computer or with another special hand-held controller, to connect or plug in this notebook or hand-held controller, and to look at the display. In the process, a checking of the storage of the adjustment in the tripping device is difficult or at least requires considerable outlay and, in fact, an extra device is required which must be connected for every adjustment, and which, in addition, is complicated and expensive.

In low-voltage circuit-breakers, LCD bar displays having a driver circuit are indeed known per se from US Patent U.S. Patent 4 429 340; in that case, however, they are used to indicate the current presently carried by the switching device, and have nothing to do with the adjustment of the tripping quantities of auxiliary releases or any adjusting operations at all. They are used for a completely different purpose, namely just as indicator, and consequently do not interact with any adjusting elements.

In general, a plurality of adjusting devices are required according to the variety of protective functions which an electronic tripping device can perform. Apart from the difficulty of arranging the adjusting devices in a manner that they are clear and easily accessible to the user, the interconnection of the adjusting devices with the electronic modules of the tripping device additionally requires a not inconsiderable outlay.

This results in the object of the present invention to provide adjusting controls for adjusting the parameters of the electronic tripping devices in which the mentioned mechanical adjusting switches are substituted by subassemblies which are technically better, less delicate, significantly simplified, consequently cost-effective, easily readable and easy to

handle for the user, and which are reliable and inexpensive.

This object is achieved according to the present invention by designing the adjusting elements as key switches and in  
5 executing the display elements as LCD elements for displaying the adjustments selected via the key switches. In this context, the adjustment of the tripping values and consequently the control of the LCD display elements can preferably be carried out via only one key set composed of  
10 three keys having the following functions:

- Key 1: Selection of the desired entry field in a continuous sequence;
- Key 2: Calibration,  
15 increase of the adjustment values in predefined steps of a bar display or gradually in fine steps to stepless in the case of an alphanumeric display;
- Key 3: Activation of the display fields,  
20 supply of an auxiliary power if the tripping device is not connected to the electrical network and, therefore, an auxiliary power is required. In this case, an auxiliary power source is brought into circuit via key 3 for a short time. This can be, for example, a battery or a capacitor.

25 The LCD displays can be designed as bar displays or as alphanumeric displays. In the case of bar displays, a scale, which can be executed with differing fineness in uniform steps, is arranged next to the LCD display. Then, the bar of  
30 the LCD display can [...] in each case according to the

## New Patent Claims

1. An electronic tripping device, in particular for low-voltage circuit-breakers, having adjusting and display elements for the tripping parameters to be adjusted, such as for the tripping current in the case of overload and for the corresponding delay time, the adjusting and display elements cooperating with adjusting devices for the parameters, and the adjusting and display elements being mounted at an operating face (1) of the tripping device, characterized in that the adjusting elements are designed as key switches (14, 15, 16), and the display elements are designed as LCD elements (2 through 9a) for displaying the adjustments selected via the key switches (14, 15, 16).

2. The electronic tripping device as recited in Claim 1, characterized in that an LCD element (2 through 9a) is provided as display element for each parameter to be adjusted, and in that only one key set composed of three keys (14 through 16) is provided as adjusting element for all LCD elements (2 through 9a) together.

3. The electronic tripping device as recited in Claim 1, characterized in that, for adjusting the tripping values and, consequently, for controlling the LCD display elements (2 through 9a) via the shared key set (14 through 16), the following mode is provided:

- Key 1: Selection of the desired entry field;
- Key 2: Calibration;
- Key 3: Activation of the display fields in the absence of auxiliary power.

4. The electronic tripping device as recited in Claim 1,

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**I. Basis of the report**

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1. This report has been drawn on the basis of (*Substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments*):

The description, pages:

5-10                      original version

1-4, 4a                  received on 07/11/2000  
with letter of 07/10/2000

The claims, Nos.:

2-9                      original version

1                        received on 07/11/2000  
with letter of 07/10/2000

The drawings, sheets/fig.:

1/3-3/3                  original version

2. The amendments have resulted in the cancellation of:

[ ] the description, pages  
[ ] the claims,            Nos.  
[ ] the drawings,        sheets/fig.

3. [ ] This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Additional observations below (Rule 70.2(c)).

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4. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to  
novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

1. STATEMENT

Novelty (N)	Claims 1-9	YES
	Claims	NO
Inventive Step (IS)	Claims	YES
	Claims 1-9	NO
Industrial Applicability (IA)	Claims 1-9	YES
	Claims	NO

2. CITATIONS AND EXPLANATIONS

see supplementary page



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1. Reference is made to the following documents.

D1: German Patent A-44 45 070 (cf. application page 2)

D2: U.S. Patent A-4 429 430 (cf. application page 3)

D3: U.S. Patent A-5 051 861 (PURKAYASTHA INDRAJT ET AL)  
September 24<sup>th</sup>, 1991

D4: Euroean Patent A-0 432 054 (MERLIN GERIN) June 12<sup>th</sup>,  
1991

**Regarding Point V**

2. An overcurrent trip according to the definition of the species in Claim 1 is known from cited reference D3. In this tripping device, the adjustment of tripping parameters is carried out with the aid of potentiometers.

Previously known are, moreover, rotary coding switches or DIP switches for adjusting tripping parameters (cf. application page 1, last paragraph).

The overcurrent trip described in cited reference D4 does not have any adjusting elements at all; these are contained in a remote control. However, this tripping device contains LCD elements to display the adjustments selected via the remote control (cf. abstract).

3. The object specified in the application is to provide technically better, less delicate, significantly simplified, consequently cost-effective adjusting controls having easily readable display elements ("subassemblies") for an electronic tripping device.

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- 3.1 The design approach according to the characteristics of Claim 1 lies in designing the adjusting elements as key switches and in executing the display elements as LCD elements for displaying the adjustments selected via the key switches.
- 3.2 To achieve this object, one skilled in the art would not only search in the technical field of circuit-breakers. This object rather presents itself in numerous areas of everyday life. Accordingly, one skilled in the art **[would]** also consider design approaches proposed in those areas.
4. The combination of adjusting and display elements defined in Claim 1 suggests a functional interaction. Such an interaction also exists in the tripping device according to D3.
- 4.1 Ruggedness and insensitivity (within certain limits) are inherent features of key switches, which does not need to be explained to one skilled in the art. Special technical features resulting in these properties are not mentioned.

However, no inventive step can be seen in the use of key switches in a rough environment in lieu of conventional adjusting elements. This is one of a plurality of possible choices one skilled in the art would make according to the circumstances, without pursuing an inventive activity, just as he/she would provide appropriately protected elements in the splash water area.

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4.2 The type of the display elements in D3 is not specified. However, it is known from D4 to provide LCD elements for displaying selected adjustments of an electronic tripping device (cf. column 3, lines 30-43).

4.3 The functional interaction defined in Claim 1 is based on a combination of known components which each function in a normal manner. A synergetic effect is not recognizable.

With regard to the subject matter of claim 1, therefore, the requirements of Art.33(3) are not fulfilled (combination D3/D4 with the knowledge of one skilled in the art).

According to the observations and point 3.2, one skilled in the art would also consider suggestions from the field of timepieces. In that field, he/she is taught, inter alia, that adjusting elements can be designed as key switches, and that display elements can be executed as LCD elements for displaying the adjustments (e.g., the alarm time) selected via the key switches. This teaching would also have to be taken into account, since the basic idea of the invention relates only to an alternative approach for entering and reproducing (selected) adjustments.

5. Regarding Claim 2: Digital timepieces generally have an LCD display and 3 adjusting knobs (usually denoted as 'mode', 'set', 'select') for adjusting numerous functions to **[sic]** (e.g., alarm, 2<sup>nd</sup> time zone, telephone numbers, etc).

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LCD bar displays (cf. claim 4) and alphanumeric displays (cf. claim 5) are known from or suggested in D2 and D4.

A scale (cf. claims 6, 7, 8) is not explicitly mentioned in D2. However, it is explained in D2 that the display elements reproduce the measured current in 10% steps in a manner that the upper end indicates the value to be adjusted (cf. column 4, lines 10-40).

Regarding Claim 9: D4 shows LCD elements which permanently present the information to be displayed (cf. column 6, lines 6-19).

The dependent claims 2-9 do not contain any features which, in combination with the features of any claim which they refer to, fulfill the requirements of the PCT with respect to the inventive step (Article 33(3) PCT).

The features defined in claims 2-9 each are one of a plurality of obvious possibilities from which one skilled in the art would choose according to the circumstances, without any inventive contribution, to achieve the set object.